PRECISION MACHINING II

Precision Machining II is a more in-depth study of skills learned in Precision Machining I, with a stronger focus on CNC setup/operation/programming. Classroom activities will concentrate on precision set-up and inspection work, as well as machine shop calculations. Students will develop skills in advanced machining and measuring parts involving tighter tolerances and more complex geometry. A continued focus on safety will also be presented.

- DOE Code: 5784
- Recommended Grade Level: Grade 12
- Recommended Prerequisites: Precision Machining I
- Credits: 2-3 credits per semester, maximum of 6 credits
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- This course is aligned with postsecondary courses for Dual Credit:
    - Ivy Tech
        - MTTC 105-Abrasive Processes I
        - MTTC 110- Turning and Milling
    - Vincennes University
        - PMTD 117- Basic Machining I
        - PMTD 118- Basic Machining II

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

Content Standards

Domain – Project Planning and Management

Core Standard 1 Students apply and adapt skills for project and job planning to ensure quality parts creation.

Standards

PMII-1.1 Employ job process planning

PMII-1.2 Apply basic problem solving to projects

PMII-1.3 Follow basic decision making rules

Domain – Job Execution

Core Standard 2 Students apply hand and machine tool processes to create machined parts per industry specifications.

Standards

PMII-2.1 Perform advanced benchwork

PMII-2.2 Demonstrate precision layout procedures

PMII-2.3 Perform advanced turning operations

PMII-2.4 Perform advanced milling operations

PMII-2.5 Demonstrate proper grinding wheel safety

PMII-2.6 Perform precision surface grinding operations

PMII-2.7 Perform drill press setup operations

PMII-2.8 Utilize CNC programming and machine tools to perform complex machining tasks

PMII-2.9 Perform advanced benchwork

Domain – Quality Process Control and Inspection

Core Standard 3 Students assess quality control and inspection processes to ensure compliance with industry and national standards.

Standards

PMII-3.1 Perform proper piece part inspection and documentation

PMII-3.2 Critique process control and improvement procedures

Domain – General Maintenance

Core Standard 4 Students Integrate preventive maintenance schedules and tasks into daily class activities to ensure safe and accurate equipment usage.

Standards

PMII-4.1 Demonstrate general housekeeping and maintenance procedures

PMII-4.2 Perform preventive maintenance tasks

PMII-4.3 Perform tooling maintenance tasks

Domain – Industrial Safety and Environmental Protection

Core Standard 5 Students apply concepts of industrial safety and recycling to meet industry and governmental environmental protection regulations and standards.

Standards

PMII-5.1 Assess machine operations and material handling safety procedures

PMII-5.2 Distinguish hazardous materials handling and disposal procedures for specific materials

PMII-5.3 Implement appropriate environmental protection measures

Domain – Written and Oral Communications

Core Standard 6 Students communicate using appropriate subject terminology and definitions both in writing and speaking to ensure the accurate reflection of ideas.

Standards

PMII-6.1 Interpret written technical instructions

PMII-6.2 Create technical specifications documents

PMII-6.3 Utilize appropriate industry language in all communications

PMII-6.4 Utilize effective listening skills

Domain – Mathematics

Core Standard 7 Students select appropriate mathematical functions needed to perform various machining processes.

Standards

PMII-7.1 Perform advanced arithmetic operations

PMII-7.2 Solve product specification problems using geometric functions as appropriate

PMII-7.3 Apply algebraic operations as appropriate in product design and creation

PMII-7.4 Use applied trigonometry

PMII-7.5 Research and apply statistics

Domain – Engineering Drawings and Sketches

Core Standard 8 Students create products within specified dimensions.

Standards

PMII-8.1 Interpret orthographic prints

PMII-8.2 Work with/from standard GD&T orthographic prints

PMII-8.3 Utilize GD&T datum, symbology and tolerances

Domain – Measurement

Core Standard 9 Students perform proper measurement procedures using appropriate instruments to ensure finished products meet given specifications.

Standards

PMII-9.1 Select and use precision measuring instruments

PMII-9.2 Use precision surface plate instruments

PMII-9.3 Convert units of measurements and dimensions to other units

Domain – Metalworking Theory

Core Standard 10 Students examine material properties and tooling processes to create finished products.

Standards

PMII-10.1 Utilize cutting theory

PMII-10.2 Select and implement proper tooling processes

PMII-10.3 Evaluate and select proper materials based on properties

PMII-10.4 Examine the capabilities of machine tools

PMII-10.5 Select proper cutting fluids and coolants for product creation

Domain – Personal/Professional Development and Employment Relations

Core Standard 11 Students establish personal and professional development plans to prepare for careers.

Standards

PM1-11.1 Maintain a continuing education plan that identifies the need for further education and training options

PM1-11.2 Prepare for exams leading to certifications recognized by business and industry

PM1-11.3 Strengthen skills needed to enter the workforce

PM1-11.4 Evaluate resources that keep workers current in the career field

PM1-11.5 Strengthen skills and attitudes needed for lifelong learning

PM1-11.6 Continually practice effective money management strategies

PM1-11.7 Strengthen career planning skills

PM1-11.8 Continually complete job applications

PM1-11.9 Keep current resumes and cover letters

PMII-11.10 Continually develop effective interviewing skills

PMII-11.11 Build ongoing teamwork and interpersonal relations

PMII-11.12 Maintain organizational structures and work relations

PMII-11.13 Maintain proper employment relations

PMII-11.14 Continually apply acceptable work place ethics and behavior

PMII-11.15 Maintain group participation and teamwork

PMII-11.16 Utilize personal group leadership skills

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

11-12.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

11-12.RT.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

11-12.RT.3 Follow precisely a complex multistep procedure when performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

11-12.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 11-12 texts and topics*.

11-12.RT.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

11-12.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Idea

11-12.RT.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question

or solve a problem.

11-12.RT.8 Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

11-12.RT.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

11-12.RT.10 By the end of grade 12, read and comprehend technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

11-12.WT.1 Write arguments focused on *discipline-specific content*.

11-12.WT.2 Write informative/explanatory texts, including technical processes.

11-12.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

11-12.WT.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11-12.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

11-12.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

11-12.WT.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

11-12.WT.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectivity to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation

11-12.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

11-12.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.